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The antifouling properties of PVA/PVAm modified polyester membrane

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Membrane separation technology has both advantages, such as low energy consumption and good separation performance, no secondary pollution and simple operation and disadvantages such as membrane fouling which is restricting the wide use of membrane separation, especially in wastewater /water treatment. Membrane fouling increases trans-membrane pressure and/or decrease the permeate flux, and increase the frequency of membrane cleaning and the membrane module replacement. In order to reduce membrane fouling, the hydrophilic membrane modification has been proved effective.

In this study, a low cost polyester filter cloth was modified with hydrophilic polyvinyl alcohol (PVA) and polyethylene amine (PVAm), to increase the hydrophilic and antifouling property. Polyvinyl alcohol (PVA) was often used in membrane modification or preparation. Polyethyleneamine (PVAm) has hydrophilic amino groups. The blend membrane with PVA/PVAm had been studied in gas separation but seldom studied in improving membrane hydrophilicity and anti-fouling performance in wastewater treatment, such as in MBR (membrane bioreactor).

In this paper, following wet-coating/drying, cross-linking and soaking procedures, PVA and PVAm were coated using a casting blade, onto polyester filter cloth, PEG (polyethylene glycol for pore-forming) and glutaraldehyde(GA, for cross-linking) were used to form polyester composite membrane. The effects of PVA/PVAm weight ratios in coating solution, the thickness of casting blade and cross-linking time, as well as the content of cross-linking agent on membrane permeation and antifouling properties were studied and compared in filtrating Yeast suspensions.

The results show that when weight ratio of PVA/PVAm was 1, the PVAm and PVA chains interacted well and uniformly, forming a network structure on the base filter, enhanced antifouling property.

The thickness of wet-coating and the time of cross-linking, as well as the content of cross-linking agent and pore-forming agent affect the permeation and hydrophilic property, and antifouling property. The best antifouling composite membrane was prepared when the thickness of wet-coating on membrane was controlled at100μm, the degree of cross-linking was 30%, and the content of pore-forming agent was 1.5% and GA was at 0.2%. After two times modification treatment, the best antifouling composite membrane can be prepared.

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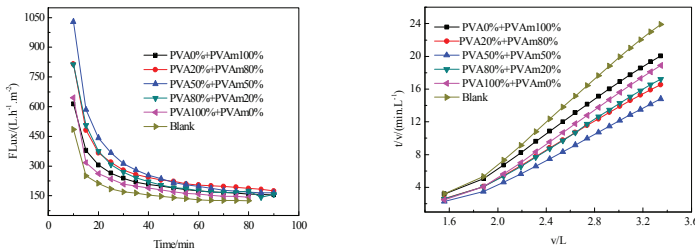

Figure 1 The Effect of PVA/PVAm ratio on membrane flux and the filtration resistances (t/V-V slopes)

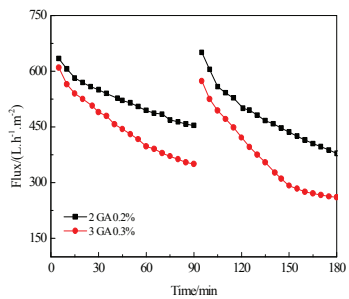

Figure 2 The comparison between 2 or 3 times coated/treated composite membrane in the Flux- time profile

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Keywords: PVA, PVAm, polyester, antifouling modification